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10/574,703	01/29/2007	Osamu Arai	0113072.00135US1	2108
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WILMERHALE/DC 1875 PENNSYLVANIA AVE., NW WASHINGTON, DC 20006			EXAMINER SWIFT, CHARLES M	
			ART UNIT	PAPER NUMBER
			2191	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/574,703	Applicant(s) ARAI, OSAMU	
	Examiner CHARLES SWIFT	Art Unit 2191	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 4/5/2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 April 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This is the initial Office Action based on the application filed on 4/5/2006.
2. Claim 1 is pending.

Priority

3. Priority is claimed to **PCT/IB04/03266 (10/06/2004)**, which claims further priority to **Japanese application 2003-346442 (10/06/2003)**, the priority is acknowledged by the examiner, and earliest effective filing date is **10/6/2003**.

Specification

4. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. The following title is suggested: **"Software development pre-processing method involves using matrix generated based on word execution condition or word definition equation, and another matrix generated based on word value calculation equation"**.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
6. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In re claim 1, limitation 1 claims “a first step for defining a statement execution unit of **any** of... **all** of which are necessary for satisfying the requirements...” This is confusing since all of L2, L, I2 and O4 processing are required and therefore all of their execution unit should be defined as well. The examiner has interpreted that the statement execution unit of **all** of L2, L, I2 and O4 processing are defined in formulating this rejection.

Claim Rejections - 35 USC § 101

7. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

8. Claim 1 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

As per claim 1, claim 1 claims a software generation method. However the claim language merely recites a series of mental steps without claiming the associated computing hardware required for the execution and is therefore not statutory under 35 USC 101. The applicant are advised to amend the claim to include the computer hardware necessary to the execution of the method to overcome this rejection.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Mejri et al. "Static Analysis on Lyee-Oriented Software". Found in "New Trends in Software Methodologies, Tools and Techniques" by Fujita et al, September 2002, IOS Press, pages. 375 – 394 (hereinafter Mejri, pages are renumbered to 1 – 21), in view of Edwards (USPAT 7100164).**

As per claim 1, Mejri discloses:

Software generation method characterized by comprising:

- a first step for defining a statement execution unit of any of L2 processing (checking process for input word's attribute), L processing (value generation processing of output word), I2 processing (logical body input processing), and O4 processing (logical body output processing), (Mejri page 5, paragraph 2 – 3, "Let's give more precision about the structure and the content of the program that will be automatically generated by Lyee from requirements. Within the Lyee methodology, the execution of a set of statements, such the ones given in Table 1, is accomplished in a particular manner. In fact, Lyee distributes the code associated to statements over three spaces, called Pallets (W02, W03 and W04) in the Lyee terminology, as shown in Fig. 2. The pallet W02 deals with

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the input words, the pallet W03 computes the calculation conditions of the words and the results are saved in some Boolean variables. For instance, the condition 'b*e>2' used within the definition of the word 'a' is calculated in W03 and the true/false result is saved in another variable 'a_cond'. Finally, the pallet W04 deals with the calculation of the words according to their definition given within the requirements. It also outputs the value of the computed words.”)

- all of which are necessary for satisfying the requirements, from word-unit statements in which the user requirements to be implemented as a program is declared by a word name, a definition equation, execution conditions of the definition equation, input/output attributes, and attributes of a word value for each logical body accompanied by access conditions and for each word on the logical body; (Mejri page 3, third to last paragraph, “Within the Lyee methodology requirements are given in a declarative way as a set of statements containing words together with their definitions, their calculation conditions and their attributes (input/output, types, and other attributes omitted within this paper for the sake of simplicity), as shown in Table 1.”, and figure 1 on page 377)

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- a second step for defining a (partial) order relation of all said defined L2 processing (checking process for input word's attribute), L processing (value generation processing of output word), I2 processing (logical body input processing), and O4 processing (logical body output processing); (Mejri page 5, second last paragraph, "Starting from the pallet W04, a Lyee program tries to compute the values of all the defined words until a fixed point is reached. Once there is no evolution in W04 concerning the computation of the word values, the control is given to the pallet W02. In its turn, this second pallet tries repeatedly to input the missing words until a fixed point is reached (no others input are available) and then transfer the control to the pallet W03. Finally, and similarly to the pallet W04, the pallet W03 tries to compute the calculation conditions of the words according to the requirements until a fixed point is reached. As shown in Fig. 3, this whole process (W04 -> W03 -> W02) will repeat until a situation of overall stability is reached and it is called a Scenario Function. Besides, it is simple to see that the result of the execution of the program shown in Fig. 1 will be the same as the result of the one shown in Fig. 2.")

- a third step for executing [code optimization] for said L2 processing, L processing, I2 processing, and O4 processing defined in the (partial) order relation defined in the second step; (Meiji page 9, section 3.1, section “optimization”, “Intuitively, the optimization of a program consists generally in introducing a series of modifications on it with the aim of reducing the size of its code, the time of its execution, the consumed memory, etc. Obviously, the optimization of a given code is a strongly desirable objective, however this spot should not in any case modify the semantics of the initial program” and page 11 – page 12, section “Optimization by Ordering Predicate Vectors”, “Now let's briefly discuss the execution time required by this program. Once the initialization vector (S4) is executed, the program attempts, in the first iteration, to give a value to the word 'a'. This attempt will fail since the calculation of the word 'a' depends on the word 'b' which has not yet been calculated. Therefore, in this first iteration, except the word 'd', the attempt of giving a value to any word will be unsuccessful. In the second iteration, the program will succeed to attribute a value to the word 'c'. In the third iteration, the value of the word 'b' will be calculated and finally in the fourth iteration the value of the word 'a'

will be found. To sum up, this program needs 4 iterations to calculate all the words. However, if we replace the program given in Table 7 (a) by the one given in Table 7 (b), the number of the iterations needed to attribute values to all the words will drastically decrease. In fact, in only a single iteration, the program will succeed to calculate all the specified words. Hence, we conclude that the order in which the predicate vectors are generated may have a deep effect on the execution time. Consequently, it will be beneficial to tell the tool that generates code from requirements (LyeeAll) how to order the predicate vectors to reduce the execution time. Fortunately, the best arrangement of the predicate vectors can be automatically and statically generated. In fact, a simple analysis of the Def=Use of each statement given within the requirements is enough to know the best arrangement of predicate vectors. Let $s = (Id, Exp_d, Exp_c, \dots)$ be a statement where Id , is the identifier of the defined word, Exp_d the expression that define it and Exp_c its precondition... Finally, we can define the ordering over the predicate vectors as follows: If a statement that define a word a is lower than another that defines a word b , then the predicate vector $L4_a$ has to appear before the predicate vector $L4_b$ in the pallet $W04$

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and the predicate vector L3_a has to appear before the predicate vectorL3_b in the pallet W03. We conclude that the best way of arranging the predicate vectors of the word given in Table 6, is the one given in Table 7 (b).")

- and a fourth step for arranging a predetermined code sequence based on Lyee methodology and relevant to the statement execution unit in accordance with an order of the statement execution units rearranged in the third step. (Mejri page 20, figure 9, "Optimized Lyee requirements" bubble to the bottom right of the diagram, and page 19, section "optimizer" near the bottom of the page, "Optimizer: Amongst others, this component implements the constant propagation techniques and generates an ordered and simplified sequence of statement suitable for the LyeeAll tool to produce a program that running faster and consuming less memory.")

Mejri did not disclose:

- Wherein the code optimization is topological sort.

However, Edwards teaches:

- Wherein the code optimization is topological sort. (Edwards col 6, line 55 – col 7, line 5, "A topological sort of an augmented CCFG is one way to determine a valid ordering (or scheduling) of the nodes in

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a CCFG. This well-known procedure recursively visits each node in the graph and adds the node to the beginning of the topological sort after visiting all of the node's successor nodes. The resulting order can easily be shown to have the property mentioned above, that is, every edge in the CCFG will lead from an earlier node to a later one. Whenever a node from one thread is followed immediately by a node from another thread, the present invention produces a relatively expensive context switch in the SCFG. Minimizing these context switches is desirable, but appears to be an NP-complete problem (it is as hard as the minimum feedback vertex set problem). Experiments suggest that using a topological sort to order nodes produces orders with acceptable numbers of context switches. However, heuristic search techniques could be applied to further reduce their number.”)

It would have been obvious for one of ordinary skill in the art at the time of invention to incorporate the teaching of Edwards into that of Mejri in order to utilize topological sort as the desired software optimization technique, It is well known in the art that topological sort is a type of software optimization technique, using topological sort can allow software optimization by execute the edges of the control flow diagram first.

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Edwards provided a motivation in support for this combination (Edwards col 4, line 17 – 20, “An easy way to further constrain a valid order of CCFG nodes is to augment the CCFG with data dependence edges (representing inter-thread communication) and topologically sort the nodes in the augmented graph.” And col 4, line 51 – 56, “While the present invention minimizes the cost of context switches, they are still relatively expensive. Minimizing context switches through a careful choice of order is desirable, but appears to be NP-complete. Fortunately, experiments suggest a simpleminded topological sort will produce acceptably efficient schedules, although heuristic search techniques could be applied to improve schedule quality.”).

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHARLES SWIFT whose telephone number is (571)270-7756. The examiner can normally be reached on Monday through Thursday, 9:00AM to 6:00PM, Friday 10:30AM - 3:30PM, Eastern Time.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wei Zhen can be reached on (571)272-3708. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/CHARLES SWIFT/
Examiner, Art Unit 2191

/Wei Y Zhen/

Supervisory Patent Examiner, Art Unit 2191